Remarks

Reconsideration is requested in view of the above amendment and the following remarks. Claims 1-3 are amended. Claims 1-9 are pending.

The amendments to claims 1-3 are supported by the original disclosure, for example Figures 1-6.

In the action, Figures 7-11 are objected to for not being designated with a label "Prior Art". Applicants propose amending Figures 7-11 to include the label "Prior Art" as indicated on the Proposed Drawing Correction submitted herewith under separate cover. Formal drawings incorporating the proposed changes will be submitted at a later date pending approval of the changes by the Examiner.

Claims 2-9 are rejected under 35 USC 102(b) as being anticipated by Hirata et al. (US Patent 5,485,308). Applicants respectfully traverse this rejection, and reconsideration is requested.

In addition, claims 1 and 4-9 are rejected under 35 USC 103(a) as being unpatentable over Hirata et al. (US Patent 5,485,308) in view of Dubin et al. (US Patent 6,278,546). Applicants respectfully traverse this rejection, and reconsideration in requested.

With respect to claims 2-9, claims 2 and 3 recite, among other features, a color-shading eliminating means having, on its light incident surface, light incident side lenticular lenses arranged so that the lengthwise axes thereof are directed in a vertical direction for converging incident light from the collimating means in a horizontal plane.

Hirata et al. discloses a rear projection type display apparatus that includes a rear projection screen 1 comprising a Fresnel lens sheet 2, a first lenticular lens sheet 3 and a second lenticular lens sheet 4. In one embodiment, the lenticular lens sheet 3 includes lenticular lenses on the incident and exit sides (Fig. 33). In the embodiments disclosed by Hirata et al., the lenticular lenses on the lens sheet 3 are arranged horizontally to diffuse light rays in the vertical direction (col. 14, lines 19-24; col. 23, lines 49-59).

Hirata et al. does not teach a color shading eliminating means having light incident side lenticular lenses that are arranged so that the lengthwise axes thereof are directed in a vertical direction for converging incident light from the collimating means in a horizontal plane. The

light incident side lenticular lenses of Hirata et al. on the sheet 3 are horizontal, not vertical as is recited in claims 2 and 3.

Therefore, Hirata et al. does not anticipate claims 2 or 3, or any claims depending therefrom.

With respect to claims 1 and 4-9, claim 1 recites, among other features, a color-shading eliminating means having, on its light incident surface, light incident side lenticular lenses arranged so that the lengthwise axes thereof are directed in a vertical direction for converging incident light from the collimating means in a horizontal plane.

Moreover, in claim 1, the light diffusing means comprises a plurality of micro beads provided on the light incident surface of the substrate sheet, and light transmitting portions formed between the substrate and the micro beads. Therefore, in the claimed light diffusing means, light passes through the micro beads, the light transmitting portions, and the substrate sheet in that order.

In the display defined in claim 1, the colored lights are incident on a transparent screen at different angles on one horizontal plane. With the claimed arrangement of the lenticular lenses, the color shading eliminating means is capable of converting the principal rays of the three colored lights into rays substantially parallel to one another. Thereafter, the rays enter the light diffusing means from the side of the micro beads. As a result of the claimed invention, it is possible to display images with little degradation of contrast by external light, with an increased angle of visibility, and with less color shading, without a decrease in the light utilization efficiency (see, e.g., page 6, lines 7-15).

Hirata et al. is discussed above with respect to claims 2 and 3. As explained above, Hirata et al. does not teach light incident side lenticular lenses on the sheet 3 that are vertical. Therefore, the light incident side lenticular lenses on the sheet 3 of Hirata et al. do not converge incident light from the collimating means in a horizontal plane. Further, Hirata et al. does not teach a light diffusing means comprising micro beads.

Dubin et al. discloses a display screen for a projection display. The screen includes a lenticular array structure that includes spheres 80 embedded in a light blocking layer 81 forming effective apertures 82, and a substrate 85 (Fig.8; col. 11, line 56 to col. 12, line 5). As described in Dubin et al., the lenticular array in Figure 8 is used in a manner such that projected light enters

from the substrate 85 side through the effective apertures 82, and exits the spheres 80 to the right (col. 12, lines 16-29).

Dubin et al. does not remedy the deficiencies of Hirata et al. Dubin et al. does not teach light incident side lenticular lenses that are arranged so that the lengthwise axes thereof are directed in a vertical direction to converge incident light from the collimating means in a horizontal plane. Further, Dubin et al. does not teach a light diffusing means with a plurality of micro beads on the light incident surface of a substrate sheet. The beads of Dubin et al. are instead on the exit side of the substrate sheet.

Therefore, in Dubin et al., much of the projected light is blocked by the light blocking layer 81. As a result, the light utilization efficiency is decreased. At the same time, the contrast can be degraded by external light. Furthermore, only the light rays that have passed through the effective apertures 82 are subjected to refraction when exiting the spheres 80, which impacts the diffusion effect of the light rays. As a result, a wide angle of visibility cannot be achieved.

Thus, even if combined, Hirata et al. and Dubin et al. do not teach or suggest the invention recited in claim 1. The combined teachings of Hirata et al. and Dubin et al. do not suggest light incident lenticular lenses that are arranged so that the lengthwise axes thereof are directed in a vertical direction to converge incident light from the collimating means in a horizontal plane, and a light diffusing means with a plurality of micro beads on the light incident surface of a substrate sheet, nor do these references teach the advantages that arise from the claimed arrangement.

For at least these reasons, claim 1 and claims 4-9 depending therefrom, are patentable over Hirata et al. and Dubin et al. Withdrawal of the rejection is requested.

Conclusion

Applicants believe that the application is in condition for allowance. Favorable consideration is respectfully requested. If any further questions arise, the Examiner is invited to contact Applicants' representative at the number listed below.

Respectfully Submitted,

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PATENT

S/N 09/869498

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Yamagishi et al.	Examiner:	Magda Cruz
Serial No.:	09/869498	Group Art Unit:	2851
Filed:	June 28, 2001	Docket No.:	10873.0735USWO
Title:	REAR-PROJECTION IMAGE DISPLAY		

Marked-Up Copy Showing Changes Made

Claims 1-3 are amended as follows.

1. (Amended) A rear-projection image display, comprising:

a trichromatic image projecting section including three image projecting sections corresponding to colors of red, green, and blue, respectively, the three image projecting sections being arrayed in one horizontal plane, each of the three image projecting sections including an image display element for displaying an image according to an input signal, and an illuminating lens for enlarging and projecting the image displayed by the image display element; and

a transparent screen on which images formed with respective color lights projected by the trichromatic image projecting section are superimposed to be displayed,

wherein:

the transparent screen includes, in an order from a side of the trichromatic image projecting section:

a collimating means for converting incident light having a predetermined flare angle from each of the image projecting sections into telecentric light and allowing the telecentric light to exit therefrom;

a color-shading eliminating means having, on its light-incident surface, light-incident-side lenticular lenses arranged so that the lengthwise axes thereof are directed in a vertical direction for converging incident light from the collimating means in a horizontal plane, and on its light-outgoing surface, light-exit-side lenticular lenses having one-to-one correspondence to the light-incident-side lenticular lenses, so as to allow principal rays of the respective lights of

the colors to be substantially parallel with one another and to exit, the respective lights being from the image projecting sections and having passed through the collimating means; and

a light diffusing means including a substrate sheet made of a transparent material and a plurality of micro beads made of a transparent material provided on the light-incident surface of the substrate sheet, light transmitting portions being formed between the substrate sheet and the micro beads, and the light-incident surface of the substrate sheet except for the light transmitting portions is covered with an opaque binder.

2. (Amended) A rear-projection image display, comprising:

a trichromatic image projecting section including three image projecting sections corresponding to colors of red, green, and blue, respectively, the three image projecting sections being arrayed in one horizontal plane, each of the three image projecting sections including an image display element for displaying an image according to an input signal, and an illuminating lens for enlarging and projecting the image displayed by the image display element; and

a transparent screen on which images formed with respective color lights projected by the trichromatic image projecting section are superimposed to be displayed,

wherein:

the transparent screen includes, in an order from a side of the trichromatic image projecting section:

a collimating means for converting incident light having a predetermined flare angle from each of the image projecting sections into telecentric light and allowing the telecentric light to exit therefrom;

a color-shading eliminating means having, on its light-incident surface, light-incident-side lenticular lenses arranged so that the lengthwise axes thereof are directed in a vertical direction for converging incident light from the collimating means in a horizontal plane, and on its light-outgoing surface, light-exit-side lenticular lenses having one-to-one correspondence to the light-incident-side lenticular lenses, so as to allow principal rays of the respective lights of the colors to be substantially parallel with one another and to exit, the respective lights being from the image projecting sections and having passed through the collimating means; and

a light diffusing means including, on its light-incident surface, lenticular lenses that converge incident light from the color-shading eliminating means in a horizontal plane, black

stripes formed with a material having a light absorbing property in a region except for places where the incident light is converged and vicinities thereof, and a light diffusing layer made of a material containing a light diffusing material.

3. (Amended) A rear-projection image display, comprising:

a trichromatic image projecting section including three image projecting sections corresponding to colors of red, green, and blue, respectively, the three image projecting sections being arrayed in one horizontal plane, each of the three image projecting sections including an image display element for displaying an image according to an input signal, and an illuminating lens for enlarging and projecting the image displayed by the image display element; and

a transparent screen on which images formed with respective color lights projected by the trichromatic image projecting section are superimposed to be displayed,

wherein:

the transparent screen includes, in an order from a side of the trichromatic image projecting section:

a collimating means for converting incident light having a predetermined flare angle from each of the image projecting sections into telecentric light and allowing the telecentric light to exit therefrom;

a color-shading eliminating means having, on its light-incident surface, light-incident-side lenticular lenses arranged so that the lengthwise axes thereof are directed in a vertical direction for converging incident light from the collimating means in a horizontal plane, and on its light-outgoing surface, light-exit-side lenticular lenses having one-to-one correspondence to the light-incident-side lenticular lenses, so as to allow principal rays of the respective lights of the colors to be substantially parallel with one another and to exit, the respective lights being from the image projecting sections and having passed through the collimating means; and

a light diffusing means including a substrate having, on its light-incident surface, lenticular lenses for converging incident light from the color-shading eliminating means in a horizontal plane, and a color layer formed at least in vicinities of light-incident surfaces of the lenticular lenses, a material of the substrate being non-colored, or colored to have a tint lighter than that of the color layer.